SOV-003
6/11/00
IN

(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number: **0 466 929 A1**

(12) **EUROPEAN PATENT APPLICATION**
published in accordance with Art. 158(3) EPC

(21) Application number: **91901640.2**

(22) Date of filing: **08.01.91**

(86) International application number: **PCT/JP91/00003**

(87) International publication number: **WO 91/11072 (25.07.91 91/17)**

(51) Int. Cl.5: **H04N 5/238**, H04N 5/335

(30) Priority: **08.01.90 JP 388/90**
19.01.90 JP 8364/90

(43) Date of publication of application: **22.01.92 Bulletin 92/04**

(84) Designated Contracting States: **DE FR GB**

(71) Applicant: **NIKON CORPORATION**
2-3, Marunouchi 3-chome Chiyoda-ku
Tokyo 100(JP)

(72) Inventor: **JUEN, Masahiro**
1702-1, Mutsuura-chou Kanazawa-ku
Yokohama-shi Kanagawa-ken 236(JP)

(74) Representative: **Martin, Jean-Jacques et al**
Cabinet REGIMBEAU 26, Avenue Kléber
F-75116 Paris(FR)

(54) STILL PICTURE PICKUP DEVICE.

(57) A still picture pickup device provided with a light quantity measuring amplifier (4) which measures a photoelectric current flowing into the overflow drain of a CCD image sensor (3), a diaphragm mechanism (2) for controlling the quantity of light incident in the CCD image sensor, and command devices (8, 9) for giving pickup start command signals. The still image pickup device is fitted so that the light quantity measurement by the photoelectric current is performed when the image sensor is in a non-operation state and thereafter the image sensor starts its pickup operation according to the start command from the command devices (8, 9). Further, the still image pickup device is provided with a diaphragm control circuit (5) which performs the feedback control of the diaphragm mechanism (2) by the light quantity measuring signal from the light quantity measuring amplifier (4) so that the light quantity measuring signal becomes equal to the reference value which is the incident light quantity giving an optimum exposure when the image sensor (3) is exposed during a preset shutter time; a diaphragm fixing mechanism (11) which fixes mechanically a diaphragm opening of the diaphragm mechanism (2) being controlled by the diaphragm control circuit (5), just before a pickup operation starts based on command from the command devices (8,9); and an output control circuit (6) for taking out from the image sensor (3) the image output signal which is picked up during the preset shutter time after fixing the diaphragm opening.

EP 0 466 929 A1

[Technical Field]

The present invention relates generally to a still picture imaging apparatus applicable to electronic still cameras, particularly such imaging apparatus of the type including an imaging device using charge coupled devices (CCDs) with an overflow drain (OFD), and more particularly the invention relates to an apparatus for performing the measurement of incident light quantity, exposure control, etc., of the imaging device.

[Background Art]

With conventional still picture imaging apparatus of the type employing an electronic imaging device, it has been well known that during the photographing operation the quantity of incident light to the imaging device is preliminarily measured by utilizing the imaging device itself without using any separate photometer device.

In this type of still picture imaging apparatus which utilizes its imaging device for light quantity measurement, the signal resulting from the light quantity measurement is utilized for performing automatic feedback control (so-called auto-iris control) of the aperture stop in such a manner that the proper exposure is ensured during the imaging operation performed immediately after the light quantity measurement. The past practice has been such that during the light quantity measuring operation the imaging device is brought into operation as during the imaging operation and also the same aperture stop control as in the case of a video camera for moving pictures is effected to make up the dynamic range thereby taking out a part of the resulting video output signal as a measured light quantity signal. However, this method is disadvantageous in that during the light quantity measuring operation preceding the photographing the imaging device is operated in the like manner as during the photographing to control the exposure and therefore a greater driving power is required. Another disadvantage is that the video output signal detected as a measured light quantity signal is an integrated sampled data in time so that there is a limitation to the operating speed of the auto-iris control and a considerable time is required until the aperture stop is stabilized in such cases as immediately following the closing of the power source and when the exposure condition is changed rapidly.

On the other hand, a method has already been proposed (Japanese Patent Application Laid-Open No.2-108924; published on April 20, 1990) in which while the imaging device is used for the measurement of light quantity, the method of obtaining video output signal is such that the imaging device comprises charge coupled devices (CCDs) with an overflow drain (OFD) and photo current flowing into the OFD is detected as a measured light quantity signal. In this method, the imaging device comprises for example a CCD imaging device having a vertical overflow drain structure. During the light quantity measuring operation, a condition is established where the driving for the imaging operation including the charge transfer operation, etc., of the imaging device is entirely stopped, that is, all the bias voltages for the imaging device are cut off. In this condition, in response to an image of an object formed on the photosensitive section of the imaging device, a photo current flowing into the overflow drain (the CCD substrate) from the photodiodes constituting the CCD photosensitive picture elements is measured and this is used as a measured light quantity signal which is utilized in the automatic exposure control for determining the desired amount of exposure at that time.

In accordance with this method, however, there still exists a problem that if the photo current flowing into the overflow drain during the time interval from the light quantity measuring operation to the imaging operation and during the imaging operation is varied, the opening of the aperture stop cannot maintain the state at the time of the light quantity measurement and the exposure control becomes unstable. There exists still another problem that where the light quantity measuring operation for the next imaging is started after the completion of the current imaging operation, even if the operation of the imaging device is cut off, the charges stored in the capacitance components of the various circuit portions connected to the imaging device are left and the next light quantity measuring operation cannot be started until these charges have been discharged completely thus giving rise to a problem for the imaging in a continuous shooting mode.

[Disclosure of Invention]

It is the primary object of the present invention to provide a still picture imaging apparatus which realizes a practical and improved exposure control utilizing a light quantity measuring method adapted to use charge coupled devices or CCDs with an overflow drain or OFD for the previously mentioned imaging device to detect a photo current flowing into the OFD as a measured light quantity signal.

It is another object of the present invention to provide such still picture imaging apparatus which is capable of automatic control for accurately and rapidly obtaining the proper exposure and which is reduced in power consumption.

is determined in correspondence to each shutter time. Also, where this type of CCD imaging device is used, the optimum exposure can be determined in terms for example of a value obtained by integrating the quantity of incident light per unit time over a shutter time. As a result, a measured light quantity signal produced by measuring a photo current flowing into the overflow drain of the imaging device is detected in the form of a measured light quantity value per unit time and a reference value for comparison purposes is also given in the form of a similar signal level per unit time.

In accordance with the present invention, the measured light quantity signal (output value) of the photometer means is not one which is sampled in time as mentioned previously and it is a light quantity value directly measured by utilizing the overflow drain. As a result of this fact, it is possible to feedback control the incident aperture stop opening of the imaging device in such a manner that the output value attains the reference value thereby ensuring the optimum exposure condition corresponding to the predetermined shutter time.

Then, conceiving a case where the aperture stop control means is realized by an auto-iris mechanism as in the usual cases, in accordance with the present invention it is only necessary to control the auto-iris mechanism by an error signal corresponding to a variation of the output value of the photometer means with respect to the reference value and thus it is possible to obtain a satisfactorily rapid response by a mechanism which is relatively simple in construction and light in weight.

Further, when imaging a still picture by this imaging apparatus, in order to prevent any erroneous operation of the aperture stop mechanism during the transition to the imaging operation and during the imaging operation and any undesired power consumption, the aperture stop fixing means mechanically fixes the aperture stop or the aperture stop mechanism immediately before the imaging device starting the imaging operation, thereby maintaining constant the aperture stop value during the imaging.

In the still picture imaging apparatus according to the present invention, the aperture stop opening detecting means detects for example the minimum aperture stop opening or the maximum opening (wide-open aperture stop) in accordance for example with the position of a moving member of the aperture stop mechanism.

The result of the detection is utilized in such a manner that if, for example, the overexposure condition still remains even if the aperture stop is closed to the minimum opening, it is utilized to select shorter one of the shutter times and corresponding another reference value in accordance with the exposure condition, whereas if, for example, the underexposure condition still exists even if the aperture stop is opened fully, it is utilized to select longer one of the shutter times and corresponding another reference value in accordance with the exposure condition.

In this case, when the aperture stop opening detecting means generates a detection output, the predetermined shutter speed is changed and simultaneously the aperture stop control is performed again in accordance with a new light quantity reference value which ensures the proper exposure with the changed new shutter time, thereby finally determining the shutter time and the aperture stop opening which ensure the proper exposure.

Also, in the case of the underexposure condition, when the aperture stop opening detecting means generates a detection output, it may be operated in association with a flash light unit or the like so as to provide an auxiliary illumination in case of need.

Also, there are cases where the aperture stop opening detecting means detects the aperture stop opening at a plurality of points and in such case a plurality of reference values can be determined in accordance with the correlation between the aperture stop opening and the shutter time so as to effect a more precise control.

Further, with the still picture imaging apparatus of the invention including the picture signal level detecting means and the shutter time correcting means, the exposure condition of the picture taken is detected directly from the video output means by the picture signal level detecting means so that if the detected exposure condition is not within the proper exposure range, a correcting operation is accomplished whereby the shutter time is changed by the shutter speed correcting means and the imaging is effected in accordance with the changed shutter time, thereby producing a picture of the proper exposure.

In such case, generally the imaging of a still picture frequently causes an aimed object to be positioned in the central portion of a picture frame and therefore it is desirable to use picture signal level detecting means which detects the magnitude of an output signal corresponding to the central portion of a picture. Depending on the purpose of imaging or the like, however, the detection of a video output signal may be effected at any other position than the central portion of a picture.

The above and other objcets and features of the present invention will become more apparent from the following description of preferred embodiments of the invention which are intended for limitation in no way taken in conjunction with the

control circuit 8.

In Fig. 1, a circuit 59 including a plurality of grounded capacitors is connected in the feed lines to the drive circuit 7, the video signal processing circuit 6 and the video level detecting circuit 10 from the first power circuit 55. The capacitor circuit 59 is schematically shown to represent for example bias capacitors for noise suppressing purposes and grounded capacitances such as circuit wiring portions, etc. Charges are stored in the capacitor circuit 59 in the feed lines when the first power circuit 55 supplies power to the respective loads. A forced discharge circuit 50, which will be described later, is connected to the feed lines so as to forcibly discharge such charges in a short period of time in response to a command signal from the system control circuit 8. The discharge circuit 50 is supplied from the second power circuit 58 and it is controlled by a command signal from the system control circuit 8 so as to perform the forced discharging operation immediately before the start of the light quantity measuring operation in the imaging operation of the imaging device 3.

Then, when the switch 52 is closed so that the power is supplied to the electronic still picture camera, the forced discharging operation is effected first and then the light quantity measuring operation for determining the desired exposure condition is effected prior to the imaging operation. In other words, only the second power circuit 58 is brought into operation first so that the power is supplied only to the discharge circuit 50, the photometer amplifier 4, the aperture stop drive circuit 5 and the system control circuit 8, and the forced discharging operation of the remaining charges on the capacitor circuit 59 and then the measurement of the light quantity incident to the imaging device 3 from the object image through the lens unit 1 are performed. During the interval between the discharging operation and the light quantity measuring operation, the first power circuit 55 is maintained in a non-operated condition by the system control circuit 8 and therefore no driving pulses and bias voltages are supplied to the imaging device 3.

Also, when the system control circuit 8 applies a command signal to the discharge circuit 50 prior to the start of the light quantity measuring operation, the discharge circuit 50 comes into operation for a predetermined fixed time to forcibly discharge the charges on the capacitor circuit 59. As a result, the remaining charges stored in the video signal processing circuit 6 and the drive circuit 7 connected to the respective electrodes of the imaging device 3 are rapidly discharged and eliminated and any undesired bias voltages for light quantity measurement are not applied to the electrodes of the imaging device. As a result, the imaging device 3 quantity measurement.

At this time, the shutter time for imaging purposes is set to a certain initial assumed value selected by the operator and the system control circuit 8 reads from its internal memory control information corresponding to the initial value. The control information includes a plurality of different light quantity reference values each of which satisfies the proper exposure condition for one of a plurality of different shutter speed values. Certain one of the light quantity reference values which ensures the proper exposure in correspondence to the set shutter speed value becomes comparative reference information for determining the desired aperture stop opening in accordance with a detection output from the photometer amplifier 4 which will be described next.

When the time limit for the operation of the discharge circuit 50 is completed so that the light quantity measuring operation is started, in a condition where the imaging operation of the imaging device 3 has been stopped completely as mentioned previously, the light current flowing into the overflow drain of the imaging device 3 is measured by the photometer amplifier 4 in accordance with a command from the system control circuit 8. The system control circuit 8 compares the measured output from the photometer amplifier 4 with the light quantity reference value and it sends a control signal to the aperture stop drive circuit 5 so as to reduce the deviation between the two to zero. The aperture stop drive circuit 5 drives the aperture stop mechanism 2 in accordance with the control signal. Thus, when the aperture stop mechanism 2 changes its aperture stop opening, the magnitude of the measured output of the photometer amplifier 4 becomes equal to the light quantity reference value and therefore the auto-iris operation by a series of feedback controls is accomplished.

Incorporated in the aperture stop drive circuit 5 is a detector 2a for sending separate signals to the system control circuit 8 when the aperture stop mechanism 2 is moved into the wide-open position and the minimum opening position, respectively.

When the system control circuit 8 receives a signal indicative of the wide-open position, the control information corresponding to the initially assumed shutter speed and read from the internal memory is changed to control information corresponding to another shutter speed of a longer time period. When this occurs, an indication of the new shutter speed is made within the finder picture area which is not shown and simultaneously the feedback control of the aperture stop mechanism 2 through the photometer amplifier 4 and the aperture stop drive circuit 5 is again initiated in accordance with the new light quantity reference value in

OV.

In the photometer amplifier 4, designated as U_1 is a MOS input operational amplifier (hereinafter referred to as an OP amplifier) and it forms, along with a resistor R_1, etc., a current-voltage conversion circuit.

Here, while the overflow drain OFD is connected to the negative input of the OP amplifier U_1 so that the light current applied from the OFD to the negative input of the OP amplifier U_1 is converted to a voltage signal, the OP amplifier U_1 is supplied from the power supply line V_{cc1} through the function of diodes D_1 and D_2 so that since the power supply line V_{cc1} is 0 volt, no bias voltage is applied to the OFD and also the dark current is within a negligible range, thus making it possible to rapidly and accurately measure the light quantity of the incident light to the imaging device 3.

On the other hand, in the imaging operating condition a positive voltage is supplied to the positive power supply line V_{cc3} and this positive voltage is usually higher than the voltage of the power supply line V_{cc1}. Thus, the power is supplied from the line V_{cc3} side to the OP amplifier U_1 through the function of the diodes D_1 and D_2. Also, the voltage applied to the positive input side through resistors R_2, VR_1 and R_3 is applied as a bias voltage to the OFD through the function of the OP amplifier U_1 and therefore a blooming suppressing effect is produced on the OFD of the imaging device 3.

Since a higher positive voltage than the V_{cc2} is supplied to the V_{cc3} of the photometer amplifier 4 in the imaging operating condition, a voltage limiter 14 is provided in the first stage of the aperture stop drive circuit 5 so that any excessively high voltage output from the photometer amplifier 4 is prevented from being applied to the part of the aperture stop drive circuit 5 following the voltage limiter 14.

A level shift amplifier is formed by an OP amplifier U_3, resistors R_6 to R_9, etc., which are arranged to follow the voltage limiter 14, so that in response to a reference voltage $Vref_1$ or $Vref_2$ selected by an analog switch SW_1 the measured light quantity output is subjected to DC voltage shift and amplified to the required degree of amplification. The selection between the reference voltages $Vref_1$ and $Vref_2$ corresponds to the selection between the assumed shutter times and in this case the number of the assumed shutter times is 2.

While the selection between the assumed shutter speeds may be effected by varying the gain of the OP amplifier U_3, to do so results in a change of the loop gain of the whole control system and therefore the selection is effected by shifting the DC voltage level as mentioned above.

Of course, the number of the assumed shutter the desired assumed shutter time may be effected by any other method.

The change-over between the assumed shutter times is effected by a change-over signal $\underline{b}$ from the system control circuit 8. Numeral 17 designates a level shifter for adjusting in level the change-over signal b and the control signal input of the analog switch $\overline{S}W_1$ to one another.

The output of the OP amplifier U_3 is applied to an aperture stop control circuit through an analog switch SW_2. The aperture stop control circuit is formed by OP amplifiers U_4 and U_5, resistors R_{14} to R_{20}, etc. The function of the analog switch SW_2 will be described later. Numeral 16 designates a part of the electric circuitry of the ordinary auto-iris mechanism and it is of the type including a rotor connected to the aperture stop blades, its driving coil, a damping coil, etc., and thus the aperture stop is stabilized when the detection signal of the OP amplifier U_3 varying in response to the opening and closing of the aperture stop becomes equal to a reference voltage $Vref_3$ through the action of the aperture stop control circuit.

Also, even if either one of the reference voltages $Vref_1$ and $Vref_2$ is selected, the input to the aperture stop control circuit becomes asymmetric with the reference voltage $Vref_3$with the resulting instabilization of the control characteristics and voltage limiting diodes D_3 to D_6 are provided to prevent it.

While the analog switch SW_2 is connected to the output side of the OP amplifier U_3 in the light quantity measuring condition, when an aperture stop fixing command signal $\underline{a}$ is applied from the system control circuit 8 immediately before the imaging device 3 is brought into the imaging operating condition through the shutter operation, the analog switch SW_2 is connected to the output side of the OP amplifier 4 and this prevents any abnormal current from flowing into the driving coil of the aperture stop mechanism 16. Numeral 15 desigates a level shifter for SW_2 control signal which is similar to the level shifter 17.

Numeral 18 designates an aperture stop opening detecting circuit and it detects the open condition of the aperture stop by utilizing the fact that when the aperture stop is left in the open condition, the output of the OP amplifier U_4 remains to be a high voltage by the reference value $Vref_3$ (in fact, it assumes a value which is dependent on the maximum driving current of the OP amplifier 4 and the impedance of the driving coil). In the aperture stop opening detecting circuit 18, a circuit including an OP amplifier U_6, resistors R_{21} and R_{22}, capacitors C_4 and C_5, etc., forms a low-pass filter, thereby preventing the detecting circuit 18 from operating erroneously due to a transient response of the

imaging device into the non-operated condition. The charges produced in the photoelectric charge storage layer 43 under the application of light are not read out to the vertical transfer register 44 and therefore the charges overflow in all the photosensitive elements in the light receiving condition or the photoelectric charge storage layer 43. Thus, the resulting photo current flowing into the overflow drain is proportional to the amount of light received at that time.

In this case, however, if some charges remain at any of the electrodes of the imaging device so that even a very small bias is applied to the electrode, a dark current is produced at the depth of the p-region 42 and it flows into the overflow drain, thus making it impossible to accurately measure only the very small photo current flowing out from the photoelectric charge storage layer 43.

The discharge circuit 50 (Fig. 1) is provided for the purpose of overcoming this deficiency. If any remaining charges stored in the capacitance portions of the circuits connected directly to the electrodes of the imaging device 3 are rapidly discharged by the discharge circuit 50 prior to the light quantity measurement, the imaging deviec 3 is placed in a completely stopped condition with no bias voltage being applied. Fig. 6 shows the potential distribution in such non-biased condition.

In Fig. 6, symbol E_F represents the Fermi level in the equilibrium condition where there is no entry of the external light. In the light-shielded condition, the photoelectric charge storage layer 43 is empty of charges and it is at the potential level I in Fig. 6. When light falls externally upon the photoelectric charge storage layer 43 in this condition, the resulting charges are stored up to the higher level II in the photoelectric charge storage layer 43 and any further continued production of charges causes the charges to flow over the p-region 42 into the n-silicon substrate 41 or the overflow drain as shown by the broken line. If the photo current flowing into the overflow drain is measured from the electrode 41A in this condition, the quantity of light received can be detected accurately. While it is of course expected that the charges produced in the phoelectric charge storage layer 43 overflow in the direction of the vertical transfer register 44, the driving for the transferring operation of the register 44 is also completely stopped as mentioned previously and therefore the charges overflowing toward the vertical transfer register side eventually overflow into the overflow drain.

Specific exemplary circuit constructions of the discharge circuit 50 are shown in Figs. 7a and 7b. Of these circuit constructions, the discharge circuit of Fig. 7a is one adapted for discharging a capacitance component C_{71} charged to a positive voltage and the discharge circuit of Fig. 7b is one adapted for discharging a capacitance component C_{72} charged to a negative voltage. In either of these circuits, a transistor is used as the switching element.

Firstly, in the discharge circuit of Fig. 7a a grounded-emitter NPN switching transistor Q_{71} is connected in parallel with the capacitance C_{71} with respect to the positive power supply (the output of the first power circuit 55). In the non-operated condition where no signal is applied to an input terminal IN, for receiving a discharge command signal, only a very small leak current flows in the emitter-collector circuit of the transistor Q_{71} and the charges from the positive power supply are stored in the capacitance C_{71}. When the positive power supply is cut off prior to the start of the light quantity measuring operation and a command signal (high signal) of a higher voltage than the reference level is applied to the input IN, from the system control circuit 8, the collector-emitter circuit of the transistor Q_{71} is rendered conductive and the charges stored in the capacitance C_{71} are discharged as a collector current.

On the other hand, the discharge circuit of Fig. 7b is constructed as a level shift circuit utilizing transistors. A PNP switching transistor Q_{73} is connected in parallel with a capacitance C_{72} with respect to the negative power supply (the output of the first power source 55) and the potential of a signal applied to its base can be dropped to a desired conduction level through level shifting PNP transistor Q_{72} and NPN transistor Q_{74} and resistors R_{73} to R_{77}. The emitter of the transistor Q_{74} is connected to the negative voltage output terminal of the second power circuit 58, thereby maintaining it at a constant negative potential V_{EE}.

In this discharge circuit, the application of a high signal to an input IN_2 from the system control circuit 8 turns on the level shift transistors Q_{72} and Q_{74} and the turning-on of the transistor Q_{74} turns on the transistor Q_{73}. As a result, the charges stored in the capacitance C_{72} are discharged as a collector current of the transistor Q_{73}.

While, in the embodiment described in connection with Figs. 1 to 3, the aperture stop opening detection is effected only with respect to the released conditions, in such cases the selection of the shutter times allows only the change-over from a short-seconds time to a long-seconds time so that once the long-seconds time has been set, it is impossible to select the short-seconds shutter speed. While, in such cases, there will be no problem if the photographing is limited to such objects involving small variations of the exposure condition in time, problems will be caused when successively shooting a plurality of objects involving considerable variations of the exposure condition.

justed to a level equal to the reference voltage V_{ref5}. This separation of the signal according to the position within the picture is effected by applying a window signal WIN to an analog switch SW_3 from the system control circuit 8. The analog switch SW_3 receives from the system control circuit 8 the window signal WIN which is synchronized with the reading of the video signal from the imaging device 3 so that the analog switch SW_3 is opened when the video output signal of the picture central portion, which is to be separated, is generated from the video signal processing circuit 6 and it is closed in other circumstances thereby holding the output level at the reference voltage V_{ref5}. An integrating circuit 36 for integrating the output of the analog switch SW_3 is reset in response to the closing of another analog switch SW_4. The analog switch SW_4 is controlled by a delayed signal from a delay circuit 38 which delays a vertical synchronizing pulse VD applied from the system control circuit 8. When the analog switch SW_4 is open, the integrating circuit 36 integrates the video output signal from the window circuit 35 and therefore the output from the integrating circuit 36 corresponds to the magnitude of the video output signal of the selected portion of the picture at that time. Numeral 37 designates a sample-and-hold circuit whereby the video ouptut signal integrated by the integrating circuit 36 is sampled by the vertical synchronizing signal VD through an analog switch SW_5 thereby generating a DC voltage as video level detection information for one picture. In the case of this circuit construction, the resetting of the integrating circuit 36 must be effected after the sample-and-hold operation has been effected satisfactorily. The output signal from the sample-and-hold circuit 37 is compared with the preliminarily stored proper exposure information within the system control circuit 8 so as to determine whether the exposure is proper.

Where such video level detecting circuit is used, when an improperly exposed picture is imaged due for example to a rapid change in the exposure condition, the improper exposure is detected within the system control circuit 8 in accordance with the output signal from the video level detecting circuit 10 and further the exposure control condition is corrected to a condition corresponding to the shutter time which should be proper in the then current exposure condition, thereby performing again the imaging operation and successively producing properly exposed pictures.

While, in the foregoing description, the imaging device for ordinary television cameras is applied to an electric still picture camera, where an imaging device having an overflow drain divided into a plurality of regions within an imaging picture is to separately provide for example such photometer circuit as the photometer circuit 4 of Fig. 2 for each of the overflow drains whereby the outputs from these circuits are mixed with suitable mixing ratios to generate the resulting value as a measured light quantity output. In this case, it is possible to obtain the accurate exposure suitable for a still picture by effecting the previously mentioned aperture stop control based on the measured light quantity information and therefore there is no need to correct the exposure by the video level detecting circuit 10.

Also, in this case, by changing the mixing ratio in accordance with the magnitude of the output of each of the photometer circuits, it is possible to change the exposure condition to the optimum condition in accordance with the condition of the object. Fig. 11 shows an example in which an imaging device having such an overflow drain of the region dividing type so as to select the mixing ratio of each measured light quantity output. In Fig. 11, the outputs of photometer amplifiers 4a to 4n corresponding to the measured light quantity signals from the divided overflow drains are each applied to and mixed in each of resistor mixing circuits 39a to 39n. The resistor mixing circuits 39a to 39n are different in signal mixing ratio from one another and each of them represents one of the several conditions of various objects which are classified experimentally.

The analog outputs from the photometer amplifiers 4a to 4n are converted to a digital signal by an A/D converter 46 and the digital signal is applied to a control circuit 47 which in turn generates a control signal SEL for selecting one or more of the outputs from the mixing circuits 39a to 39n. The control signal SEL is applied to a multiplexer 60 so that the multiplexer 60 selects for example one of the outputs from the mixing circuits 39a to 39n in accordance with the content designated by the control signal SEL and the selected mixing circuit output is supplied as a control signal to the aperture stop drive circuit 5 (Fig. 1).

By performing such control, the exposure condition is controlled under the exposure condition suited for a still picture or under the exposure condition desired by the photographer.

Claims

1. In a still picture imaging apparatus including a CCD imaging device having an overflow drain, photometer means for measuring a photo current flowing into the overflow drain of said imaging device, aperture stop means for controlling the quantity of light incident to said imaging device, and command means for gen-

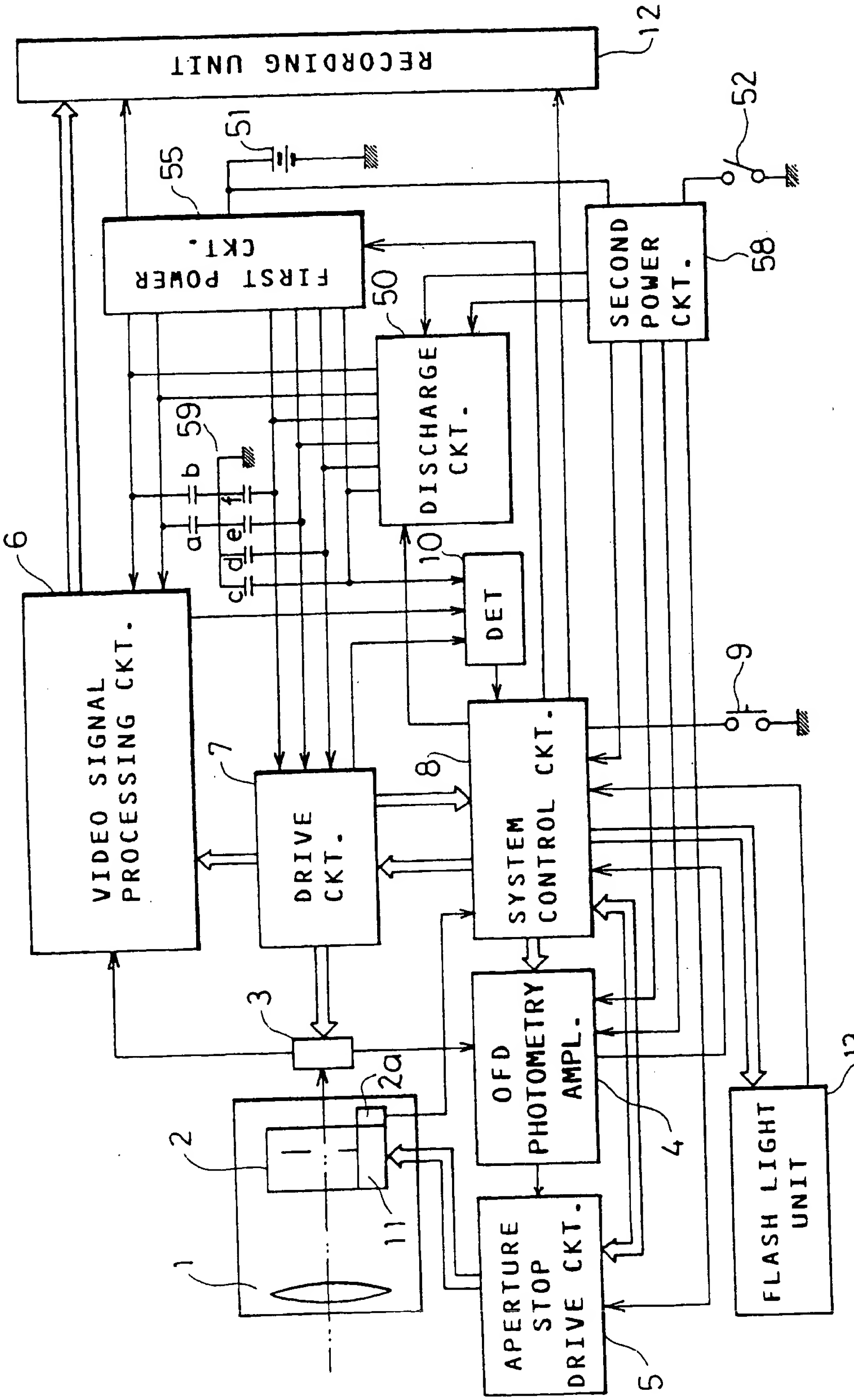
RECORDING UNIT
12
FIRST POWER CKT.
55
51
SECOND POWER CKT.
58
52
DISCHARGE CKT.
50
59
a
b
c
d
e
f
DET
10
VIDEO SIGNAL PROCESSING CKT.
6
DRIVE CKT.
7
SYSTEM CONTROL CKT.
8
9
3
2a
2
1
11
OFD PHOTOMETRY AMPL.
4
APERTURE STOP DRIVE CKT.
5
FLASH LIGHT UNIT
13

FIG.1

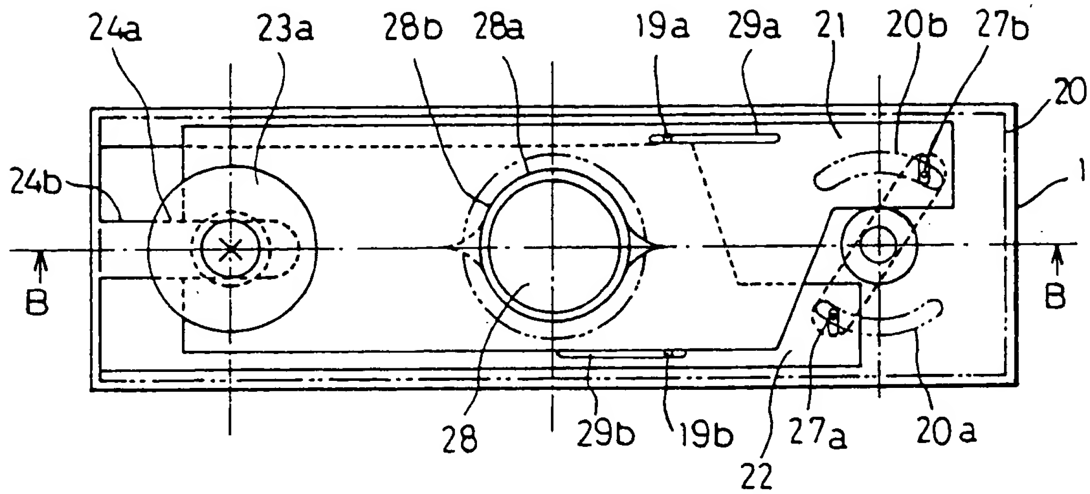
24a
23a
28b
28a
19a
29a
21
20b
27b
20
24b
19
B
B
28
29b
19b
27a
20a
22

FIG.3a

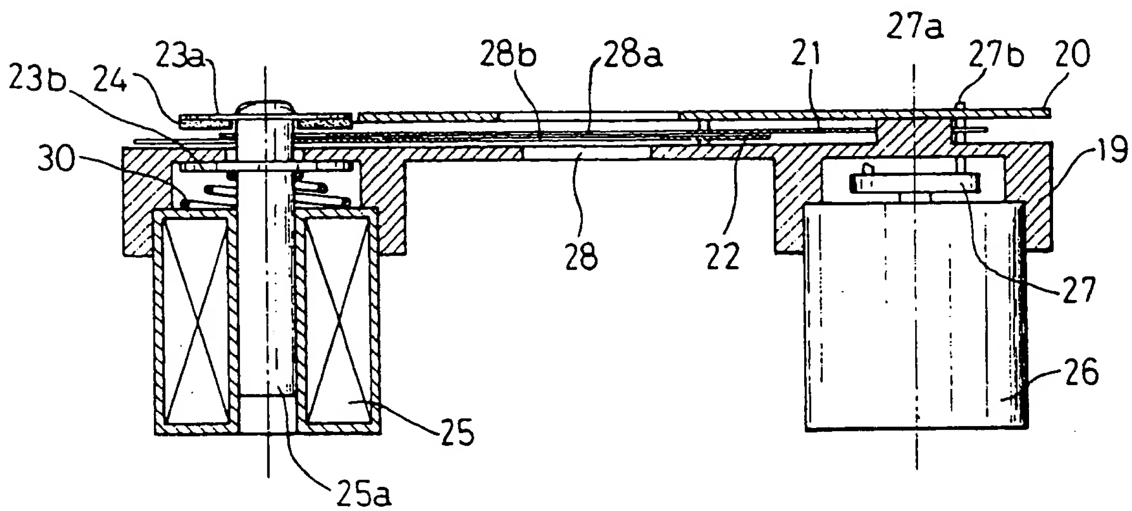
27a
23a
28b
28a
21
27b
20
23b
24
30
19
28
22
27
26
25
25a

FIG.3b

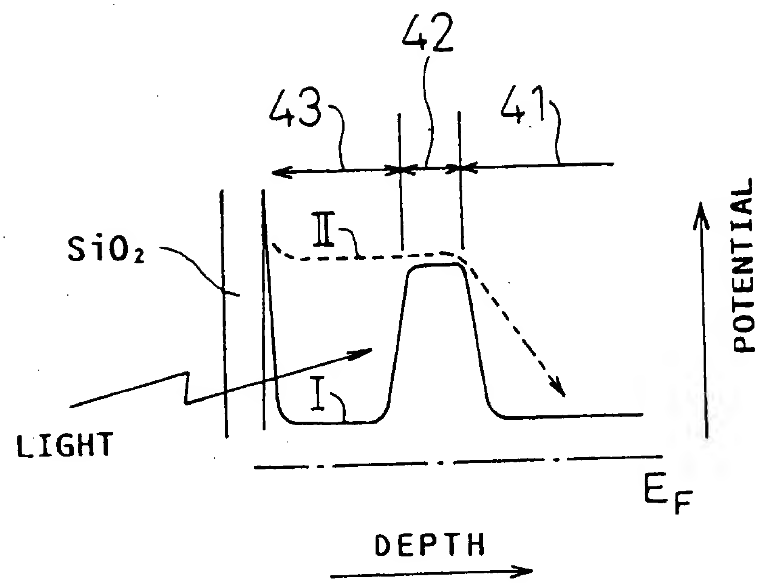

FIG.6

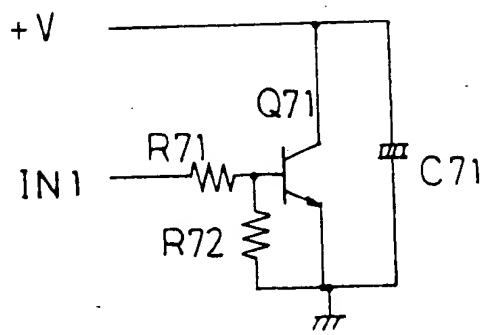

FIG.7a

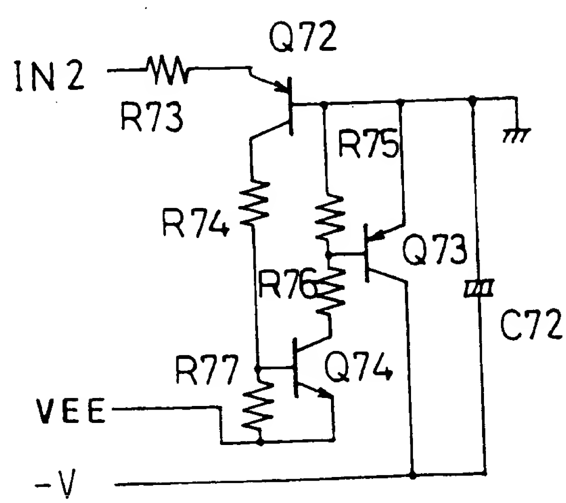

FIG.7b

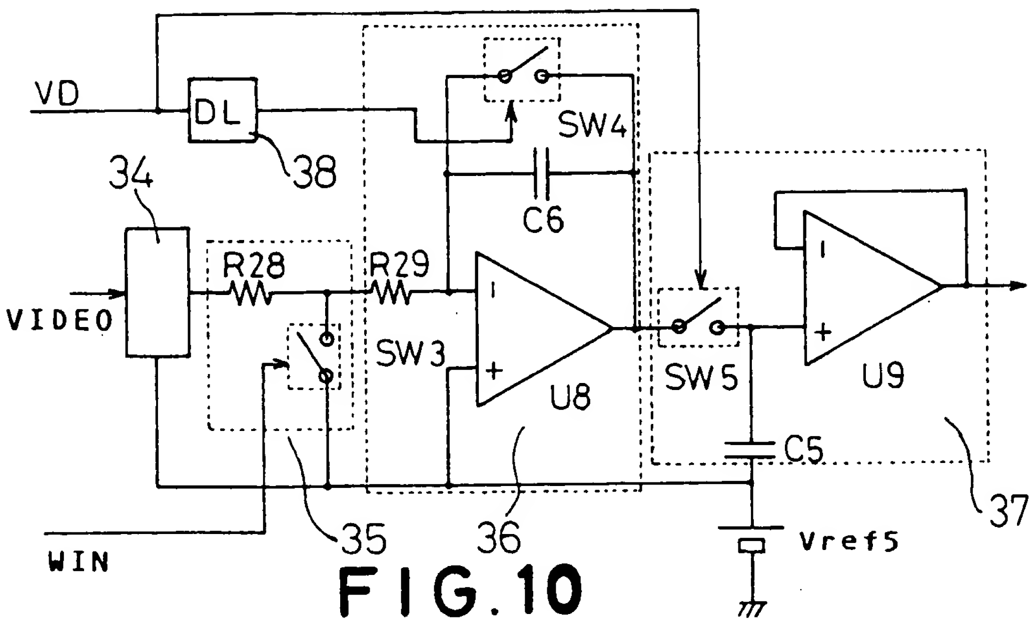
VD
DL
38
34
SW4
C6
R28
R29
VIDEO
SW3
U8
SW5
U9
C5
37
35
36
WIN
Vref5

FIG.10

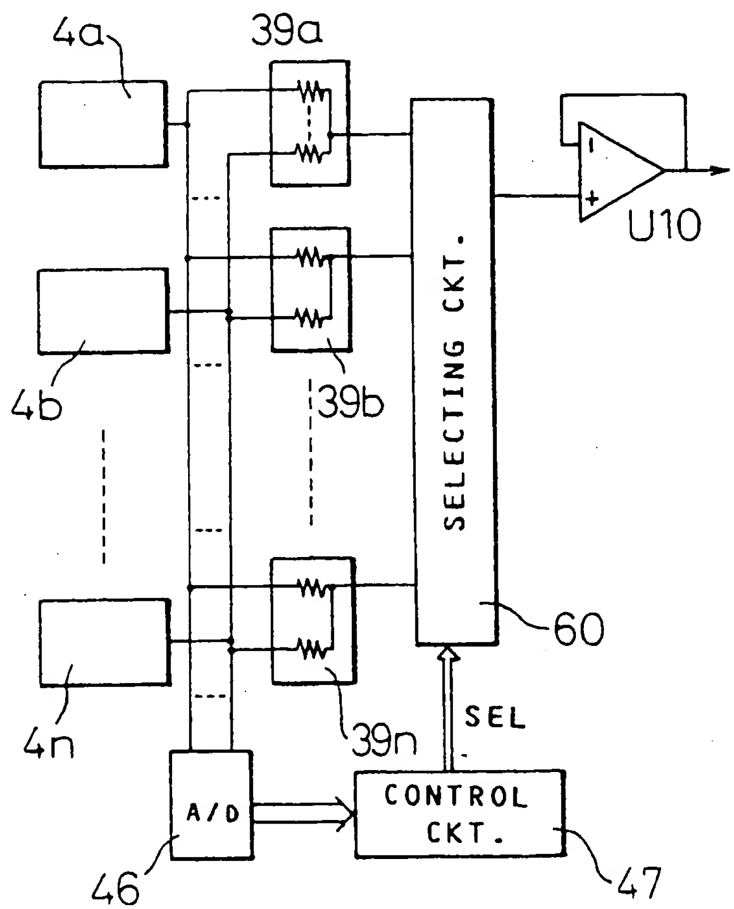
4a
39a
U10
SELECTING CKT.
4b
39b
60
4n
39n
SEL
A/D
CONTROL CKT.
46
47

FIG.11